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Household appliance and dispensing system for dispensing a fluid and additive

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Household appliance and dispensing system for dispensing a fluid and an additive

EPO - DG 1

25. 01. 2002

(76)

The invention relates to a household appliance according to the introductory portion of claim 1 and to a dispensing system according to the introductory portion of claim 17.

5

Such a household appliance and such a dispensing system are known from international patent application WO 99/27176.

Household appliance in which a fluid is dispensed exist in many varieties, for instance in the form of irons with facilities for dispensing steam and/or water, hair dryers which dispense hot air or air humidifiers which dispense water and air. The household appliance known from the aforementioned document is an iron for ironing textile. In this iron, the fluid dispenser for moistening textile before or during the ironing process includes a water reservoir and an additive dosing system for adding an additive to the water, for instance to improve the ironing of the textile or to provide it with a pleasant smell. The reservoir for containing the fluid is a water reservoir. The pumping means for pumping the water and additive from their respective reservoirs to a mixing chamber are situated between the water and additive reservoir and the nozzle. In one embodiment a separate pump for pumping additive is provided in addition to the water pump. In another embodiment a single pump pumps water and additive and two capillaries and an adjustable valve control the concentration.

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Although the separate pumps may enable accurate and independent control of the respective water and additive flow rates, the use of two separate sets of pumping means also brings along some disadvantages. For instance, the application of two separate pumping means will add to the manufacturing costs and will make the appliance more bulky and more susceptible to mechanical failure. Furthermore, the appliance will be more complex to operate. In the second embodiment, accurate control of the concentration is difficult to achieve, because the pressure drop over the adjustable valve is relatively small and the viscosity of the additives may vary between additives and with the temperature of the additive. Furthermore, the capillaries and the adjustable valve form passage with very small

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cross-sections over which small pressure drops are applied, so the passages can easily clog up.

5 It is an object of the invention to provide a solution wherein the above-mentioned drawbacks are avoided. To that end, a household appliance according to claim 1 is provided. According to another aspect of the invention this problem is solved by providing a dispensing system according to claim 17.

10 By positioning the outlet of the additive reservoir such that additive will enter the conduit downstream of the pumping means, the dosing can be carried out in a section of the conduit where a substantial pressure is provided by the action of the pump so that relatively predictable pressure conditions are obtained. Accordingly, the concentration can be controlled more reliably and the risk of clogging up is reduced. Furthermore, the concentration of additive in the dispensed fluid responds more quickly to changes in the  
15 additive supply rate, if the additive supply is started, stopped, increased or decreased.

To also control the supply of additives, the pumping means preferably include first pumping means for pumping fluid from the supply means towards the dispensing nozzle and second pumping means for pumping additive from the additive reservoir into the conduit.

20 To pump additive from the reservoir towards the fluid conduit, the reservoir can be provided with a displaceable or deformable separation, such as a plunger or a membrane. On the side of the separation facing away from the outlet pressurizing means can be provided for exerting a pressure upon said separation, to force additive at the other side of the separation out of the reservoir.

25 By providing an inlet passage interconnecting the fluid dispensing system and a second compartment of the additive reservoir separated from a first compartment containing the additive by the aforementioned separation, fluid pressure from the dispensing system is guided into the reservoir and serves as pressurizing means. Consequently, only one pumping device is sufficient for pumping both the fluid to the dispensing nozzle and additive from the additive reservoir to the dispensing system. This results in a simple, compact and  
30 low cost dosing system. A particular advantage of this solution is that the pressure at which additive is being expelled is directly related to the pressure at which the fluid is fed. Hence, the more the pressure at which fluid is fed is increased, the more pressure is exerted for expelling additive. Consequently a very constant additive concentration is obtained.

By providing that the inlet connecting the dispensing system to the first compartment branches off the conduit, at a position between the first pumping means and the outlet, it can be ensured in a simple manner that the pressure passed to the inlet is higher than the pressure at the position where the outlet meets the fluid conduit.

5 By providing a fluid flow restriction in the conduit between the inlet and outlet of the additive reservoir, a desired pressure drop can be generated between the inlet and the outlet of the additive dosing system for driving additive supply.

10 Preferably, the fluid flow restriction is adjustable. This offers a user the option of influencing the pressure drop over the additive dosing system reservoir to regulate the additive concentration. Furthermore, the fluid flow restriction is preferably provided with a small leakage flow. Such a leakage flow ensures that as long as no water is dispensed, the pressure drop over the fluid flow restriction, and thus over the additive reservoir, will decrease and preferably will become zero. This will effectively stop undesired additive flow.

15 An inlet flow restriction means can be provided in the inlet, which connects the dispensing system to the additive reservoir. These inlet flow restriction means affect the pressure drop over the additive reservoir and hence offers an alternative possibility of regulating the flow rate of additive. Such a restriction does not suffer from the risk of clogging up due to caking of additives and from poor predictability due to varying additive flow properties.

20 By providing the outlet between the additive reservoir and the dispensing system with an outlet flow restriction means, the flow of additive towards the fluid conduit can be controlled very accurately. Since a substantial pressure drop is maintained over the outlet restriction the risk of clogging up is very limited and the sensitivity to variations in flow characteristics of the additive is relatively small.

25 Preferably, the outlet restriction includes an oscillating valve. This is particularly advantageous when the additive to be dosed is very concentrated and very small dosages are required to obtain and maintain a desired, constant mixture composition. Since, in such a valve the cross-section is varied constantly, the risk of clogging up and the influence of flow characteristics of the fluid are further reduced.

30 The activation of the outlet flow restriction can be synchronized with the operation of the first pumping means. Such synchronization makes sure additive is only released when water is being dispensed. It furthermore allows for a very simple operation of the appliance, wherein, for maintaining a constant mixture of water and additive, a user can simply operate the pumping means.

The above and other advantageous embodiments of the invention are set forth in the dependent claims.

5 To explain the invention, exemplary embodiments of a household appliance will hereinafter be described with reference to the accompanying drawings, wherein:

Fig. 1 is a schematic view of a dispensing system according to a first exemplary embodiment of the invention;

Fig. 2 is a schematic side view of a household appliance including a  
10 dispensing system according to Fig. 1;

Fig. 3 is a schematic view of a dispensing system according to a second exemplary embodiment of the invention;

Fig. 4 is a graph depicting operation of a valve of the systems in Figs 3 and 5 in relation to operation of the pump; and

15 Fig. 5 is a schematic view of a dispensing system according to a third exemplary embodiment of the invention.

In this description, the same or corresponding parts are designated by mutually identical reference numerals.

20

Figs. 1 and 2 show a household appliance in the form of an iron 27 with an ironing sole 28 a handle 29 and a dispensing system 1 for dispensing a first fluid 2. In this example, the fluid is water. Another common fluid dispensable by irons is steam, which is usually dispensed via the ironing sole 28.

25

The dispensing system 1 comprises supply means including a reservoir 3 for containing the water 2 and a pump 8, a conduit 6 and a spraying nozzle 5. The conduit 6 connects the reservoir 3 to the dispensing nozzle 5. The pump 8 is adapted for pumping the water 2 from the reservoir 3 towards the dispensing nozzle 5. The pump 8 may for instance be a piston pump and can for instance be driven manually or, as is shown in this example,  
30 electrically operated by means of a switch 9. Applied in an iron, the water can be dispensed onto textile to be ironed, to help eliminating pleats and facilitate the ironing process.

The dispensing system 1 is provided with a dosing system 10, with which dosing system an additive 12 can be added to the water 2. When applied in an iron, the additive 12 can for instance be an additive for enhancing the iron properties or smell of the

textile to be ironed. The dosing system 10 comprises a second reservoir 14 having a substantially cylindrical shape. The reservoir 14 is divided into an additive chamber 18 and a pressurizing chamber 16 by means of an axially moveable plunger 15. A removable lid 17 closes off an open top end of the reservoir 14. When the lid 17 is removed additive 12 can be  
5 filled into the additive chamber 18. The additive is preferably a liquid. Compared with gases and vapors, liquids generally contain a relatively large amount of effective constituents and can be handled relatively easily.

The reservoir 14 is connected in parallel to the dispensing system 1 by means of an inlet 20 and an outlet 22. The inlet 20 branches off from the conduit 6 downstream of  
10 the pump 8 and debouches into the pressurizing chamber 16 of the reservoir 14. The outlet 22 is connected to the additive chamber 18 and communicates with the conduit 6 at a position downstream of the position where the inlet 20 branches off from the conduit 6, preferably at a short distance (less than 2 to 4 cm) of the dispensing nozzle 5.

The dosing system 10 furthermore comprises a fluid flow restriction 24 and an  
15 inlet flow restriction means 25 for controlling the flow rate of additive 12 into the dispensing system 1. The fluid flow restriction 24 includes an adjustable one-way valve, mounted in the conduit 6, between the inlet 20 and the outlet 22. During operation of the pumping device 8, this fluid flow restriction 24 generates a pressure drop  $\Delta P$  between the inlet 20 and the outlet 22. The inlet flow restriction 25 includes an adjustable valve as well in the inlet 20. With this  
20 inlet flow restriction 25, the flow of water 2 towards the pressurizing chamber 16 of the reservoir 14 can be regulated. Together, the pressure drop  $\Delta P$  and the flow rate of water 2 into the reservoir 14 determine the concentration of injected additive 12 in the water dispensed by the dispensing system 1.

The dosing system described above, works in the following manner. When a  
25 user activates the pump 8 an amount of water 2 is pumped from the supply means 3 towards the dispensing nozzle 5. Part of the water 2 is pumped towards the pressurizing chamber 16 of the reservoir 14 through the inlet 20, due to the pressure drop  $\Delta P$  generated by fluid flow restriction 24 and limited by the inlet restriction 24. A portion of the pressure drop is exerted onto the plunger 15, which causes additive 12 in the additive chamber 18, to be urged into the  
30 outlet 22 towards the water conduit 6. The additive 12 entering the conduit 6 mixes with the water passing therein and is subsequently sprayed out via the dispensing nozzle 5.

The inlet flow restriction 25 enable a user to regulate the flow rate of water 2 towards the first compartment 16 and with this the flow rate of additive 12 urged to the dispensing system 1. Preferably the outlet 22 is provided with a conical spout 26, biased in

the flow direction A of the water 2 in the conduit 6, thus enabling a smooth, fluent transition of the additive 12 leaving the spout 26 entering the water 2. Advantageously the transition trajectory is designed such that at or near the point where the additive 12 enters the water flow, some turbulence exists, accompanied by a small pressure drop. The turbulence enables good mixing of the additive and the water.

By having the additive 12 enter the water 2 at a point near the dispensing nozzle 5, the risk of the subsequent mixture getting segregated before being dispensed is minimized.

Preferably the one-way valve 24 allows a small leakage. This leakage ensures that the pressure difference  $\Delta P$  over the additive reservoir 14 will quickly return to zero after the pump 8 has been switched off, preventing uncontrolled leakage of additive 12.

With a dispensing system described above the water 2 and additive 12 can, first separately and later combined, be pumped towards the dispensing nozzle 5 with one single pump 8. Moreover, during the pumping the additive 12 will not contact the pump 8, which prevents the pump 8 from getting contaminated and prevents the additive 12 from being adversely affected by movements and pressures occurring in the pumping device 8. Furthermore, the dosage of additive 12 can be controlled easily and accurately by adjusting the inlet flow restriction 25. Also, the additive dosage is related to water supply pressure and thereby to the amount of water being fed by the pump 8. Hence, fluctuations in the water supply will cause similar fluctuations in the supply of additive 12 to the water 2, as a result of which the overall composition of the fluid-additive mixture will remain very constant, without any need for the user to interfere.

Fig. 3 shows an alternative embodiment of a dosing system 10 according to the invention, in which an outlet flow restriction 30 is provided in the outlet 22, to regulate the flow rate of additive 12 towards the conduit 6. The inlet flow restriction means 25 illustrated in Fig. 1 are omitted. The outlet flow restriction 30 is provided in the form of oscillating valve. Furthermore, a mixing chamber 32 is provided, where the outlet 22 meets the conduit 6.

With the oscillating valve 30 the flow rate of additive 12 towards the conduit 6 can be very accurately controlled at a constant, desired value. This is for instance advantageous in case where the additive is highly concentrated and small amounts of additive need to be dosed.

Preferably, the activation of the oscillating outlet flow restriction 30 is coupled to the operation of the pumping device 8 so that oscillation stops and the valve is closed

when the pump 8 stops and oscillation starts when the pump starts as is illustrated by Fig. 4. This ensures that no additive 12 gets spoiled once the pumping means 8 and dispensing of water 2 is stopped.

5 The mixing chamber 32 allows the additive 12 and the fluid 2 to be mixed to a homogenous mixture, to be dispensed by the nozzle 5.

It is observed that providing the restriction in the inlet or the outlet is advantageous for preventing or at least reducing overdosage at start-up of the fluid flow. When the fluid flow is started, the pressure build-up precedes the increase of the flow rate to equilibrium at the given pressure. Since the flow rate of the additive 12 is relatively low, the  
10 additive flow reaches a flow rate in the range of the flow rate during constant operation more quickly than the fluid flow.

Fig. 5 shows a third embodiment of a dosing system 10 according to the invention, in which the driving means for driving the additive 12 out of the additive chamber 18 are formed by a spring 35 mounted on the side of the separation 15 facing away from the  
15 additive chamber 18. The spring co-operates with the plunger 15 to force additive 12 contained in the second compartment 18 towards the outlet 22 and into the conduit 6. Like in the embodiment shown in Fig. 3, the flow restriction 30 is provided in the outlet 22 towards the water conduit 6. The outlet flow restriction 30 allows the outlet to be blocked completely when the pump 8 is inoperative, so the flow rate of additive can be stopped completely even  
20 though the feeding pressure on the additive 12 is maintained even when the pump 8 is inoperative. As in the previously discussed embodiment, a mixing chamber 32 is provided for mixing the additive and the fluid before being dispensed by the dispensing nozzle 5.

By using a spring 35 as pressurizing means a simple drive structure for driving additive to the conduit 6 is obtained. Moreover, all pumping capacity of the pump 8 is  
25 available for pumping the water 2 towards the dispensing nozzle 5.

The invention is not limited to the embodiments as described. For instance, the flow restrictions can be embodied by other types of valves than described in the above drawing. When applied in an iron, the additive reservoir as well as the water supply means and in particular the fluid (water) reservoir can be at least partly disposed outside the iron.  
30 The additive can also be dosed to other fluids than water, for instance to steam dispensed by the iron or to air. The appliance can be any appliance from which fluids are dispensed, such as hair dryers, air humidifiers or coffee makers.

## CLAIMS:

EPO - DG 1

25. 01. 2002

(76)

1. A household appliance comprising a fluid (2) dispensing system for dispensing a fluid (2) and a dosing system for dosing an additive to said fluid (2);

said fluid (2) dispensing system comprising fluid supply means (3, 8), a dispensing port (5), and a conduit (6) connecting said supply means to said dispensing port (5);

said dosing system comprising an additive reservoir (14) for containing the additive (12) and an outlet (22) connecting the additive reservoir (14) to the dispensing system; and

said fluid supply means including pumping means (8, 15, 16, 20, 35) for pumping the fluid (2) and the additive towards the dispensing port (5);

characterized in that the outlet (22) of the additive reservoir (14) communicates with the conduit (6) at a position downstream of said pumping means (8, 15, 16, 20, 35).

2. An appliance according to claim 1, wherein the pumping means (8, 15, 16, 35) comprise first pumping means (8) for pumping fluid (2) from the supply means towards the dispensing port (5) and second pumping means (15, 16, 20, 35) for pumping additive (12) from the additive reservoir (14) to the conduit (6).

3. An appliance according to claim 2, wherein the second pumping means comprise driving means (16, 20, 35) and a displaceable or deformable separation (15) bounding an additive chamber (18) of the additive reservoir (14) for receiving the additive (12), the driving means (16, 20, 35) being adapted for exerting a driving force on said separation (15) for forcing additive (12) out of said chamber (18) through the outlet (22) and to the conduit (6).

4. An appliance according to claim 3, wherein said driving means comprise an inlet (20) and a pressurizing chamber (16) of the reservoir (14) on a side of said separation (15) facing away from the additive chamber (18), said inlet (20) interconnecting said

pressurizing chamber (16) and said conduit (6) for conducting fluid (2) pressure from the conduit (6) to said separation (15).

5. An appliance according to claim 4, wherein said inlet (20) branches off the conduit (6), at a position between the first pumping means (8) and the outlet (22).

6. An appliance according to claims 5, further comprising a fluid flow restriction (24) in the conduit (6) between said inlet (20) and said outlet (22), for generating a pressure drop between said inlet (20) and said outlet (22).

10

7. An appliance according to claim 6, wherein said fluid flow restriction (24) is adjustable, to control the pressure drop over said fluid flow restriction.

8. An appliance according to claim 6 or 7, wherein the fluid flow restriction (24) comprises a one-way valve.

15

9. An appliance according to any one of the claims 6-8, wherein the fluid flow restriction (24) is adapted for allowing a leakage flow, at least during non-operation of the first pumping means (8), for neutralizing the pressure drop over said fluid flow restriction.

20

10. An appliance according to any one of the claims 4-9, further comprising an inlet flow restriction (25) in the inlet (20), for adjusting the flow rate of fluid towards the pressurizing chamber (16).

25

11. An appliance according to any one of the preceding claims, further comprising an outlet flow restriction (30) in the outlet (22), for controlling the flow rate of additive towards the conduit (6).

30

12. An appliance according to claim 11, wherein the outlet flow restriction (30) comprises an oscillating valve

13. An appliance according to any one of the claims 10-12, wherein the inlet and/or outlet flow restriction (30) and the first pumping means (8) are connected to operating

means (9) for synchronized operation of the inlet and/or outlet flow restriction (30) and the first pumping means (8).

14. An appliance according to any one of the preceding claims, further comprising  
5 a mixing chamber (32) in the fluid conduit (6), disposed downstream of the outlet (22).

15. An appliance according to any one of the claims 11-14 and claim 3, wherein the driving means comprise a spring (35).

10 16. An appliance according to any one of the preceding claims, wherein a downstream end of the outlet (22) is arranged for biasing a flow direction of additive (12) leaving said outlet (22) with respect to a flow direction of the first fluid (2) in which the additive (12) is injected.

15 17. A dispensing system for dispensing a fluid (2) and an additive (12) from a household appliance, comprising fluid supply means (3, 8), a dispensing port (5), a conduit (6) connecting said supply means (3, 8) to said port (5), pumping means (8, 15, 16, 20, 35) for pumping the fluid (2) from said supply means towards said dispensing port (5), an additive reservoir (14) and an outlet (22) connecting the reservoir (14) to the conduit (6),  
20 characterized in that the outlet (22) of the reservoir (14) communicates with the conduit (6) at a position downstream of said pumping means (8, 15, 16, 20, 35).

## ABSTRACT:

25. 01. 2002

(73)

A household appliance has a fluid dispensing system for dispensing a fluid (2) and a dosing system for dosing an additive to the fluid (2). The fluid dispensing system includes fluid supply means (3,8), a dispensing nozzle (5), and a conduit (6) connecting the supply means to the dispensing nozzle (5). The dosing system comprises an additive reservoir (14) for containing the additive (12) and an outlet (22) connecting the additive reservoir (14) to the dispensing system. Pumping means (8,15,16) are provided for pumping the fluid (2) and the additive (12) towards the dispensing nozzle (5). By providing that the outlet (22) of the additive reservoir (12) communicates with the conduit (6) at a position downstream of said pumping means, a reliable dosing of additive is achieved. A dispensing system for such an appliance is described as well.

Fig.1

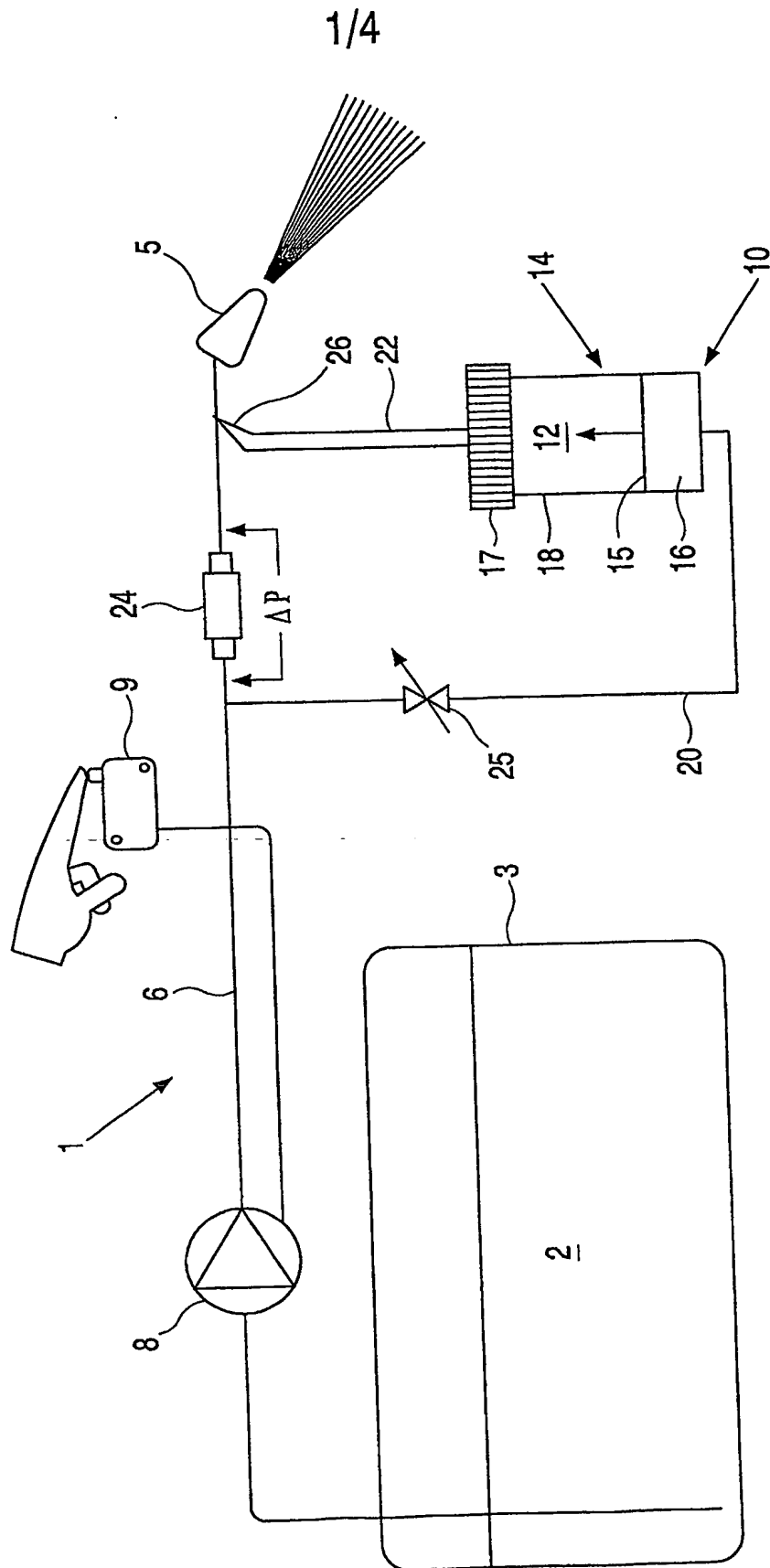


FIG. 1

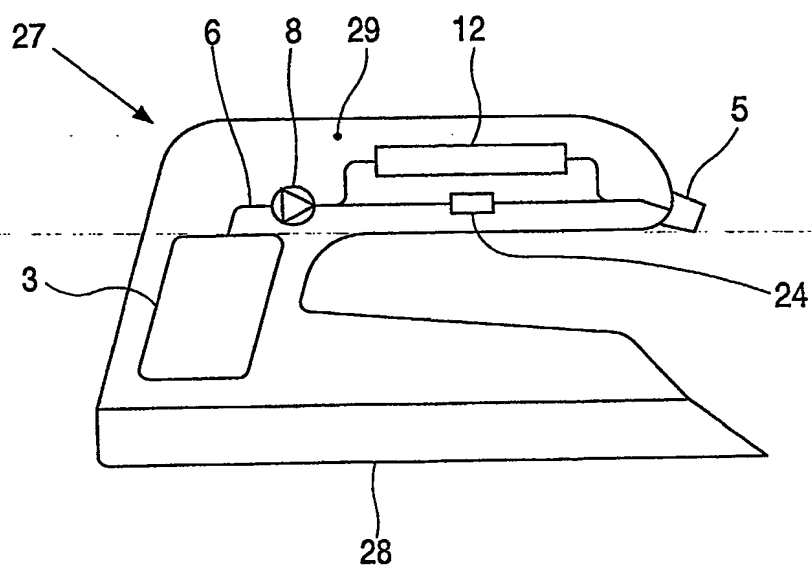


FIG. 2

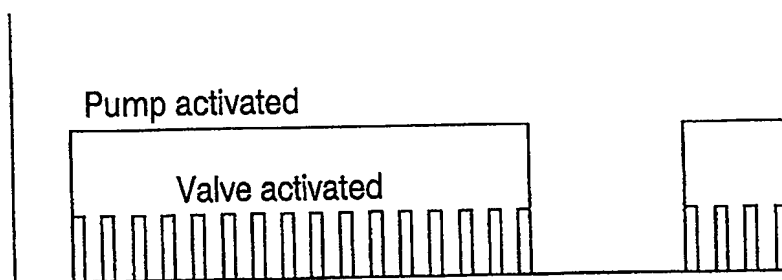


FIG. 4

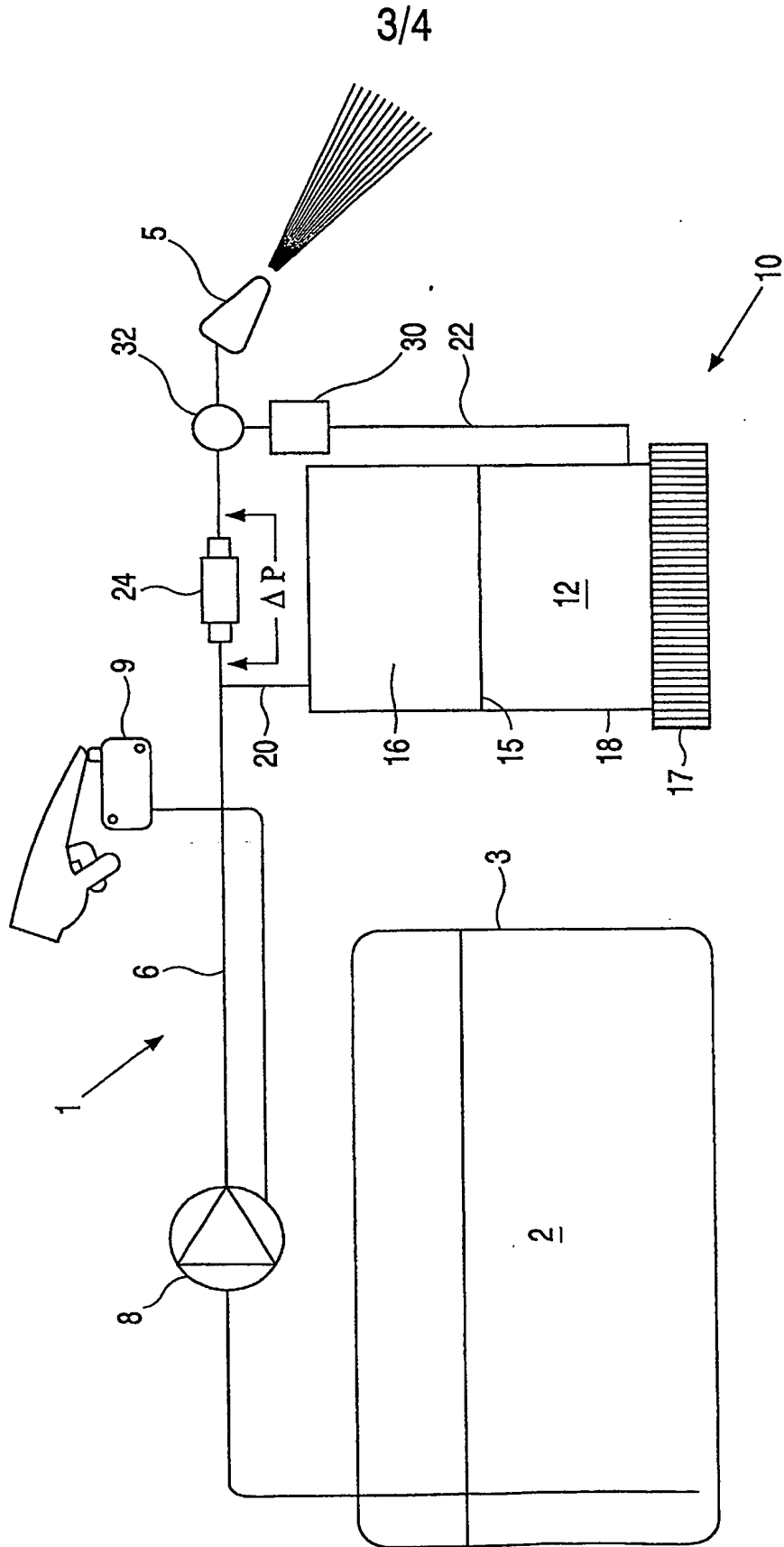


FIG. 3

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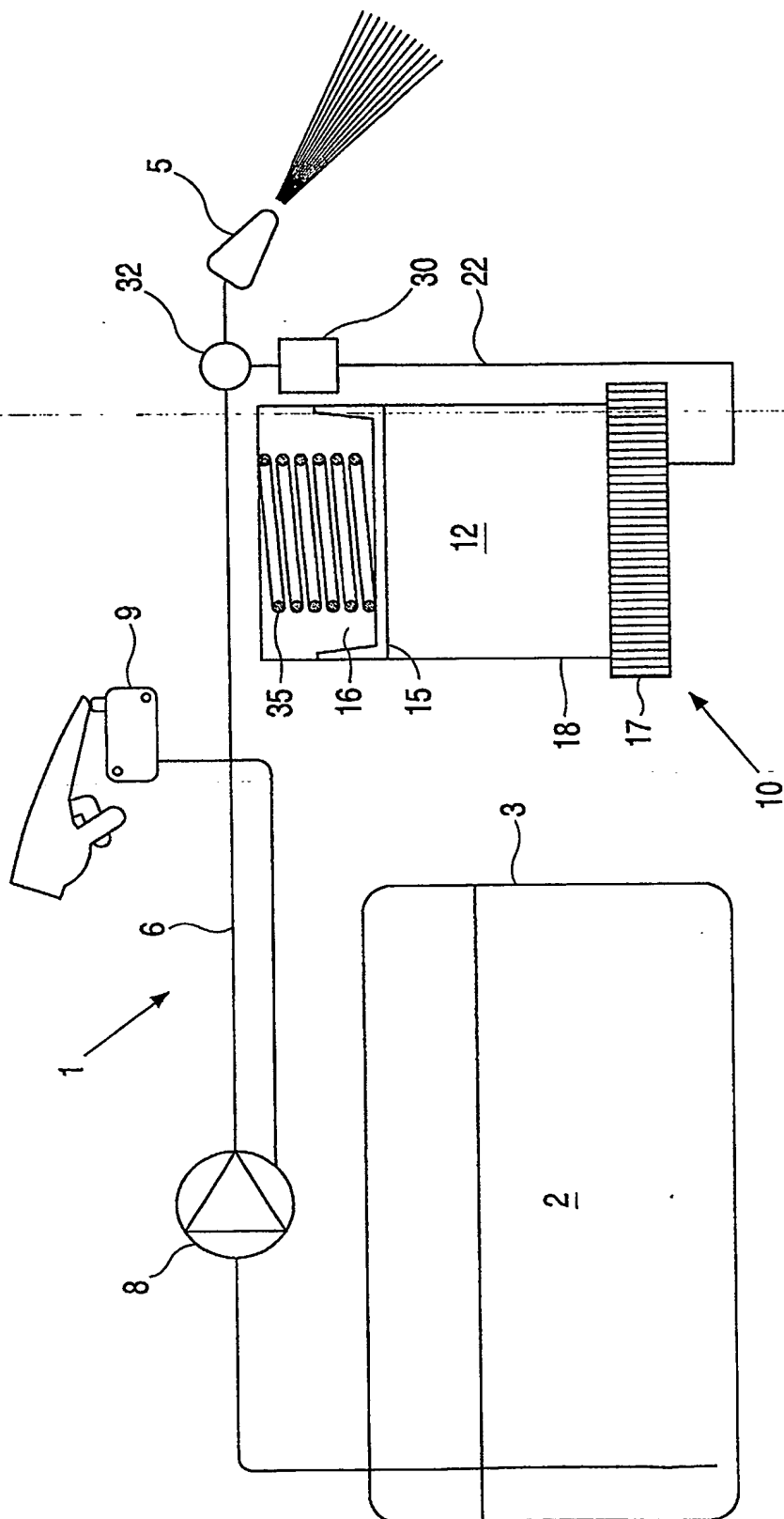


FIG. 5